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AVIATION

The Oldest American Aeronautical Magazine

COMMERCIAL AVIATION IN *Canada*

PLANE TO GROUND *Radio* COMMUNICATION

THE *Federal Budget* AND AERONAUTICS





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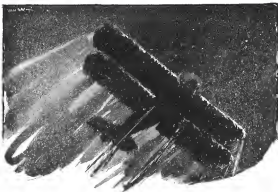


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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

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EDWARD P. WAKNER, Editor

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Trusting the Trustworthy

IN THE THIRD SECTION of the *Age Commerce* set of 1926, which put the Federal Government into the business of aircraft regulation, there is a paragraph that has had but little notice from the Aeronautics Branch during the first two years of its existence, or from the general aeronautical public at any time. It reads: "As a basis for rating [of aeronautics of aircraft] the Secretary of Commerce may in his discretion accept in full or in part the reports of properly qualified persons employed by the manufacturers or owners of aircraft. The Secretary may accept any such examination and report by qualified persons in lieu of examination by the employees of the Department of Commerce. The qualifications of any person for the purposes of this section shall be demonstrated in a manner specified by and satisfactory to the Secretary." These provisions were not added into the law by its authors for mere ease of complicating the language. They were inserted, upon presumably expert advice, with the expectation that they would be very definitely useful.

It is gratifying to see an interesting tendency to make use of them. Most conspicuous of recent examples is the announced plan of approving repair shops competent to service and rebuild airplanes of specified types. An earlier and less spectacular example was furnished by the approval and rating of flying schools. The Aeronautics Branch is increasingly adopting the policy of investigating the qualifications of the men who does the work, be it mending of fuselages or teaching of students to fly, instead of confining itself to examination of the finished product.

Emphatically a move in the right direction. The next step, already approached in a small and hesitant way, will be to accept as sufficient the verdict of the approved organizations. The graduates of a reputable medical school does not have to pass an exacting governmental examination upon his professional qualifications before being admitted to practice. The fact of graduation from

a Class A institution is evidence of competence. The standard maintained by reputable flying schools necessitates the approval of the Department should be high enough so that the ability of the students whom they graduate to pass any sort of test should be taken for granted. Still more clearly, the quality of the work done in an approved shop or factory ought to be so far beyond question as to make any inspection, except an occasional surprise check, quite redundant. The reputable organization that expects to say in business cannot afford to turn out incompetent graduates or unsafe work. We have not yet attained the point of being able to sweep away detailed inspection, but we should be moving in the direction of decreasing its burden. The Department's latest proposal is of the sort that will make relaxation of inspection possible without increased hazard. We await further progress.

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The Budget

EACH YEAR there is a great excitement in Washington as the first of December approaches, bringing with it the opening of Congress and the presentation of the Federal Budget. Each year alarming rumors are whispered about. Each year, almost without exception, the anticipation proves to have been worse than the facts, and when the Budget appears it fails to contain the prophecies of disaster.

The present month, with its presentation of the Budget for 1931, has been no exception to the common rule. Analysis of the bulky volume that the President transmitted to Congress, enterprises elsewhere in this issue, will make the minds of aeronautical enthusiasts comparatively easy. The excitement of September, when it was learned about that the prospects of military and naval aviation were to be scrapped is false, proves to have been justified unless there has been a great change of

policy is Washington in the intervening three months. Certainly there is nothing in the finished product to give material support to such extreme claims.

At the same time, we cannot but regret that the provision for aerial operations in the Army and Navy was not made more liberal. Officials of the executive departments are forbidden to apply to Congress for any increase in the sums recommended by the President, but we entertain a hope that the House and Senate will act upon their own account for a more generous treatment of aviation, as they have done several times in the past. Especially unfortunate is the reduction in the allowance for new airplanes for the Navy. While the training days of the aerial appropriation for new equipment, as compared with that for the previous year, is due to the airplane's having developed longer lives in service than they were expected to show, and is indirectly a feather in the cap of aviation, it would have been worth while for these preparing the present Budget to reconsider the whole position, and especially to offset with the advisability of considerably increasing the total number of aerial airplanes provided by the five-year program. At the time when that authorizing act was passed aircraft operation at sea was in the highest degree experimental. There was a limit to the capacity with which it could be developed. It has now become, we say it without qualification and with some knowledge whereof we speak,—the most nearly irrefragable of aerial activities. Flying at sea does not abrogate the necessity of other types of aerial operations, but it takes first rank among them. It is distracting to see any suggestion of backsliding in the financial provision for the development of the air arm. It is distressing that with the total aerial appropriations recommended for a five per cent increase the increase for aerial aviation should be at only half that rate, so that the proportion of the total assigned to aeronautical purposes would actually show a loss as compared to the previous year. We are willing to applaud to the utmost any reasonable program of economy upon military and naval expenditures, but in the light of the last two years of military and naval maneuvers aviation should be less than its full proportion of any cost, instead of receiving less than a proportionate share of an actual increase in total expenditures.

As we have remarked before, this magazine has no military policy, and we have scrupulously refrained from touching upon military topics. We do so only because the provision of new military aircraft is an industrial question as well as a military one. For years the military demand furnished not only the lacking of the aircraft market but all the market that there was. Then commercial aviation came to the fore. Now commercial production has checked off materially. It would be peculiarly unfortunate if there were to be any reduction in military demand or in apparent wealth of feeding of the War and Navy Departments towards aeronautical development at the same time.

Concerning the slowdown for commercial aviation there is no room for complaint. This slow material, and on the whole satisfactory, progress. The work of the Department of Commerce in investing control over commercial aviation has now been so unfolded that emergency additions to its facilities are no longer required. The Aeronautics Branch has fully, taught us, and can begin to consider the possibility of taking on new tasks, such as standardized performance testing and air facilities.

The nature of the demands upon government funds occasioned by aerial construction and maintenance is changing. So far as lighting and emergency fields are concerned the major burden will hereafter be of maintenance rather than of new construction, but scientific development is likely at any time to require the provision of wholly new activities on existing routes. Thus for the first two years of aerial work the appearance of communications received relatively little attention. Then the telephone circuit and the radio station became a major necessity. Towards this new work as well as towards those activities which have become more or less routine through three years' experience, the Budget has shown a reasonably and correspondingly sympathetic attitude.



Airport Visibility

AN AIRPLANE is circling over a city. Fed is running low. The pilot is peering anxiously downward. He has a snap, which asserts that the local airport is three miles southeast of the town. But experience has taught him that the three miles is likely to be only an approximation. The statement of compass direction includes an equal reference of error. There is probably no clue to the point within the city from which the measurement of the three miles began. Nobody,—no find the field.

The low-visibility "steepers," modestly dignified as a pastime, is less common than it was a couple of years ago, but it is still out with commonly enough to constitute an annoyance and a possible hazard. It does little good to demand the air controller that he would have no trouble if he would only keep up hand the Department of Commerce leader concerning the field. Quick aside from the fact that identification occasionally presents difficulties even with that aid, no pilot can be relied on to keep in his place the hundreds of separate circulars pertaining to all the fields that he may at some time visit to use.

The responsibility of locating the field cannot be thrown upon the pilot's unaided efforts. There are who pick the site and develop a map give him all possible aids. Little-used flying fields acquire very much

like other open sites from a little distance, and hazards are not always sufficiently distinctive from other buildings in appearance to furnish an instant identification of their purpose. The emergency field has no hangers, or the nearest layout with use or tea, is most likely to be unutilized and most likely to escape attention.

Not one of them should lack some definite marking. The conventional orange yellow circle at the intersection of the runways may seem a costly luxury, but the reversed white of the field, and the peace of mind that will be brought to incoming strangers, are out of all proportion to the cost. But the mere marking of an airport as such, while necessary, is not enough.

We feel a just grievance against cities that fail to write their names upon their highest buildings, but we must once in a while against them with clean hands. At the very least we should be able to identify our own landing fields. Especially is this important now that several fields as once heretofore a city, with the pilot desiring to seek a particular one. Every one of them should be so marked as to stand out and catch the eyes of each pilot. Every one should have some designation of the town or city to which it has nearest, and some distinctive landmark identifying terms. The usefulness of emergency fields is so much enhanced by proper marking that we earnestly hope, notwithstanding the expense involved, that the Department of Commerce with its immediate survey fields will set the example.



Refusing Details

THE LONG TIME SUCCESS of any manufacturing enterprise is often measured by its flexibility—the one with which it adapts itself to changing conditions peculiar to its industry and to those underlying trends that affect all industry. As any industry gains in years of experience its resistance to the inevitableness of change approaches the calm firmness of an unyielding nature and, while a new organization may meet with the rash petulance of a thwarted child.

The aircraft industry, a veritable giant among infant industries, has in the past few years drunk so freely from the cup of prosperity that it "comes but one well worn path to the spring of replenishment—a road paved with inflated orders and sheltered by increasing stock quotations. Figuratively, its source has been "Full speed ahead—down the tarpaulin."

Now, when profits appear to disturb the feverish progress along the old tariff trail, there is a tendency to break for cover, with a little strategy to reassure ourselves that things that have changed don't change. After all, perhaps there is in the current situation an opportunity to accomplish certain things most necessary to the

continued long-time success of the industry, which simply would not have seemed attractive had conditions remained as they were, and which would have led to a future readjustment of far more serious proportions.

Perhaps the status from which the industry is just emerging may best be characterized by a doubtful desire to keep up with the current rather than to spend time squaring up production and design details. The policy has appeared in many instances to be centered in a too keen desire to present an invulnerable face front—a complete hide from any sport place to appear transport—land, water and air. Concentration of design and production energies on such a program naturally left many loopholes in the details of design and production from an economic viewpoint. Once capable of successful aerodynamic performance and actual shop production, creative energy has ultimately been diverted from the "finished job," to start now at an additional design needed to round out the sales program.

The intersection of the lines of demand and supply in the aircraft industry has provided the opportunity for careful introspection. It is no longer a question of how many planes or types of planes can be produced, but of how well they are suited for specific commercial purposes and how economically they can be built. Hence the real opportunity to convert apparent defeat into redemptive victory.

A careful analysis of existing production and design details will disclose untapped opportunities for refinements and economies. It is just as reasonable to take stock at this time of these details as to follow the same procedure with respect to materials in the stockhouse. Material and process developments have been so extensive that it is reasonably safe to say that an existing design embodies all the major possibilities known along this line. In addition to the possibilities of incorporating already established production economies in existing design, the present situation provides an opportunity for the far-seeing organization to catch its breath and review its current production from the angle of refinement of detail.

Even the signing up of the lines of a hull or fuselage, with little or no loss in aerodynamic efficiency, may bring about a startling economy in production costs. More detailed consideration of simplification possibilities, either in line with required standards in the industry, or between various models of a given manufacturer, may result in considerable production economies. No detail is so small for consideration. Even is so small a thing as washer welding style of the process may result in savings that are appreciable when it is considered in the light of the thousands of washers so attached on a large plane. Hence lies a real opportunity to capitalize the present situation,—and as the ability successfully to utilize presented opportunities for refining details is hatched the structure of every successful organization.

A SURVEY OF Canadian COMMERCIAL AVIATION

J. A. Wilson,
Controller of
Civil Aviation
for Canada



An Interview with J. A. Wilson,

Controller of Civil Aviation for Canada

By FAY LEONE FAURET



A picture at Leamington, Ont., last spring taken before the first company operations in 1939.

DURING the next generation no material factor will, itself, ever overcome more effectively this aviation," declared J. A. Wilson, Controller of Civil Aviation for Canada, as he pointed to the several spots on the large map of the Dominion which covered one side of his office in Ottawa, "Canada is a big country. It is made for aviation, and aviation has done more to open up our northern country than any other single agency. Three-fourths of the area of the Dominion is still un-served by roads or railways. That great undeveloped area known as the Canadian Shield, with an area of approximately 1,800,000 sq. miles is a dominant feature of Canada composed of very recent rocks of the Precambrian type. It is a veritable store-house of mineral wealth. Furthermore, the vast forests, which lie to the north are the sole reserve still unexploited for the industry dependent on them. During the past centuries geologists say that the sea in its alternate advances and retreats has deposited lagoons, mud-flats and shale, and in places secondary mineral, leaving vast areas suitable for farming and grazing. These are of course unexploited and will remain little was known of them. Through this area, too, flow some of the great rivers of the world, whose waters may be harnessed for the development of many millions of horsepower of hydro-electric energy. Finally, there are the chief ore-producing districts of the world and fisheries which, it is believed, will have an enormous future, once the way is opened for a market for this important food.

"Then, the railways opened up the prairie provinces, but it remained for the advent of commercial flying to make possible the exploration and mapping in winter as well as in summer of the northern and lakes, the great

farming areas, the barrens, and the vast mineral areas never before reached except by canoe and dog team.

"The northern part of the American continent is as completely drenched with water-ways that it is a paradise for the airplane. For the hard place there is little use, especially as the establishment of proper take-off and landing fields for this type of craft would be prohibitive generally in the northern zone served by air, except, perhaps, in a few isolated instances. Of course this was fortunate, since without these ready-made landing places, such as the surface of a lake or river offered such a rapid development of aviation could not have taken place. In winter the ice-covered lakes and rivers make an perfect air-roads for landing on snow. Thus the airplane knows no limitations; only when the ice is forming or is breaking up is there difficulty and certainly this is not for long.

"THE AIRPLANE" is free to go everywhere easily and quickly. Fundamentally it is an inexpensive way to travel. It needs no right of way, no expensive road bed, very little attention; organization, only machines, pilots, a few well-equipped bases and a well-organized distribution of fuel caches. Moreover, the airplane produces its results quickly. Man thus simplifying transportation, it has made air surveys possible. The country may be sketched or photographed almost as quickly as one can fly over it. Millions of miles of hitherto unexplored country may thus be examined by the pilot; the extent of forest and water ways plotted, hydro-electric sites located, maximum crops explored. In a word, aviation has given us for the first time a means of really ascertaining what Canada's

resources actually are, and the extent to which they may be profitably utilized.

"Air service in Canada is now confined for the most part to transportation of explorers, prospectors, lumbermen, photographers, Government officials, mail and light cargo, and important accessories and repair parts for machinery which must be taken on to otherwise inaccessible country. Passenger service, as understood in the United States where coast-to-coast flying is made in 48 hours, is negligible, but it is coming fast.

"Civil aviation in Canada dates back to the close of the Great War. Many of our pilots returned eager to take up their time flying, but they found no market for their ability. It was not until the early summer of 1939 that plans for the use of aircraft in forestry reconnaissance were ordered near Quebec.

"The people of Canada bent on doubling at least the productive area of the Dominion, set themselves the task of selling back their Northern Frontier. Naturally, better means of transportation was the first need. Using the first sole means of transport, the canoe, the pack train and in winter the dog team, the coverage of hundreds of thousands of square miles was a physical impossibility. A few men who had trodden the region knew something about it, but our maps had many areas, for lack of definite information. We either walked unexplored or left blank.

"The successive Governments, both Provincial and Dominion, were quick to see the possibilities of aircraft as an aid in solving the problem of Northern exploration and development. They live their aid by the organization of such activities as would facilitate travel, observation and transport. Of course, the progress was slow

for the first two or three years. War craft were not suitable for commercial endeavors. The first attempt at flying was slight pleasure planes and stunt flyers were making no money. Only those interested in the administration of the Northern area and their exploration and development strongly supported the flying services in their endeavor to adapt this new form of transportation to the very different conditions existing in the North. Although an Air Board Act had been passed and the first Air Board formed, in 1923 there were important changes in the organization of the flying services. The Air Board became part of the newly formed Department of National Defence. The Civil Operations Branch was organized with the Royal Canadian Air Force and continued as a part of that Branch until July, 1927, when it was again separated from distinctly military work. The Air Board was quick to see the value of the airplane in dealing with forest fires. Perhaps only those who have lived in Northern and Western Canada appreciate fully the need for adequate fire protection in the forest and on the prairie.

"A few seasons after the Armistice was signed, plans were perfected for trials of flying boats over the Northern forest. The Dominion Government, the Forest Service of the Province of Quebec, and one of the large pulp and paper companies shared the expense. These experimental flights made in 1919 were so successful that they led to the establishment in 1920 and 1921 of air stations at Juvik, Inuvik, Yellowknife, at Moosonee and later at High River and Hudson, the Provincial Governments of Quebec, Ontario, Manitoba and British Columbia leading government and co-operating in every way

They could to insure the success of this new forest reconnaissance. By the fall of 1932 the provinces took over the management of their own flying operations. The Dominion Government has since concentrated its efforts in the building up of an efficient air organization to meet its own requirements. Permanent bases for the repairing and maintenance of aircraft, the buying of gasoline trucks through all the territory served, the establishment of radio stations to improve communication, and the design and construction of new types of aircraft especially that of the Canada Division, have all come under its supervision. From a few improved bases from which were created the forty fleet of 11, 5, 24, and 175, the service has now grown so that it covers all Northern Canada and serves not only for the forest protection, but a great variety of other useful work as well.

The Civil Government Operates Branch under the Department of National Defense, now maintains:

No. of Officers	74
" Airmen	249
" Aircraft	86
" Central Depot	1
" Main Stations	3
" Sub Bases	1
" Caches	120
" Wireless Stations	15
" Paratrooper Detachments	8

Area patrolled approximately 100,000,000 acres in Manitoba, Alberta and Saskatchewan; area photographed in 1932—40,000 sq. miles; area photographed in 1938—64,000 sq. miles; total area photographed—over 300,000 sq. miles to date; flying time—1937—3,472 hours, 1938—9,502 hours, 1939—4,200 hours (January 1 to Feb. 31).

The work includes forest protection, exploration and surveys, transportation of men and supplies and regular parties (payment of Indian treaty money, air photography and forest surveying, fishery patrols) on mail and experimental service. Every Government service interested in the administration and conservation of



The R.C.A.F. biplane and forest patrol work.

Canada now makes use of aircraft as a normal part of their work. Flying is an every-day business in Canada. Many of the pilots have records which if made in the full place of publicity would have made them famous in the North they are part of the day's work and so are no public sensation. These men are being successful in the North, Hudson and Down. In the many thousands of hours of flying done during the past few years in the far North, not one single accident involving death or

serious injury has occurred. Considering the unusual conditions under which this work has been done, this record stands as a remarkable testimony to the skill of the flying personnel.

"THE FLYING SERVICE, though it cannot in the circumstances receive an actual cash dividend to the Government for services rendered, is self-sustaining in every sense of the word since it is maintained because of the services that it is and find it efficient and cannot well do without it. For example, the present service has been one of high fire hazards, large losses have been ascribed, but the forest service has always been able to keep the situation under control. They have maintained their fire fighting organization in good order. They have been able to concentrate their efforts on areas of greatest value and highest hazard. They know from day to day what the situation is and what their losses are. Without aircraft this would have been impossible because of the lack of good communication which the air services now supply. They have been able to work intelligently and effectively. Formerly, they worked in the dark.

The Provincial Air Service of Ontario, which was formed in 1923 as a branch of the Department of Lands and Forests, now has functions similar to those of the Dominion Civil Government Air Services Division, and do a great variety of useful work all through the Northern districts of Ontario. They maintain 4 service stations and 10 sub-stations, 20 commercial pilots, 27 air engineers and 25 aircraft. The growing demand for their assistance is reflected in the record of flying time:

1934	2,905 hours
1935	2,740
1936	3,540 "
1937	4,861 "
1938	6,227 "
1939	5,463 " (January 1 to July 20)

Aircraft has also been used in the Province of Quebec and British Columbia, although their manner of operation has been different. Here, no provincial air services have been formed, but arrangements have been made with commercial operators who supply the aircraft and personnel to do the flying necessary. Their support has been invaluable in assisting the establishment of independent air companies for fire protection, forest reconnaissance, transportation of supplies, air photography, fishery patrols, exploration and treasury work and other recreational services.

Several of the large mineral exploration companies such as the Northern Aerial Minerals Exploration Ltd. and Dominion Explorers Ltd. the Consolidated Mining and Smelting Company and so forth maintain their own aircraft. Leaders in the air services field were the Canadian Airways Ltd., in Eastern Canada, and the Western Canada Airways who, starting early in 1937 with a single aircraft, now own 33 planes of the latest types and are prepared to take passengers or freight to any part of the Dominion.

The great mineral fields in Northern Quebec, Ontario and Manitoba gave a great impetus to prospecting all through the country. Most of these new mining camps were far from the railways, and aircraft operations, over they had demonstrated their ability, found an immediate demand for their form of transportation. Of course, starting as they did with small types of planes, and completely successful in the northern regions because of the changed conditions under which they were called upon



Picture 3 Pilots stand with planes and crew in making inspection work in Canada.

to work some of their present experiences were secret but a new type of airplane had to meet the requirements and satisfy the conditions of Northern service powered with no-aided engines became available. The efficiency of the service increased. The saving of time, the comfort, ease and safety with which long distances may be covered was truly an entirely positive. Catches of fuel have been had along the coast and in the great river basins, and no district in Canada, however inaccessible, is beyond one or at the most two days' travel by air from one of these. This is true not only in summer but also in winter. During the short winter season of incursions these supplies are taken in bulk, the necessary small amounts needed to supplement them at times going by air. Truly it may be said that the only closed season for aviation in Canada is when the ice is forming or breaking up.

The following figures showing the flying time, mileage and engines carried by the Western Canada Airways are illuminating and interesting:

	1938			
Flying Time	Passengers	Fuel lb.	Miles	Mileage
6,780 hours	9,648	1,192,087	122,170	343,000

1939			
(from January 1 to September 30)			
Flying Time	Passengers	Freight lb	Miles lb
7,219 hours	10,788	1,419,291	239,086

"Canadian aviation has grown without subsidy because it has filled an economic need. It is to the credit of the air pioneers that they have been able to operate wholly as their own revenue, furthermore, under conditions which are often dreary. Some aircraft go out from their bases and like the birds, stay on without shelter during the whole season. Between overhauls they sit over a burner. An improvement has come on the back of a lake or river is all the home they have. So far in

only at the main bases that machine shops and dispensaries have been provided. The inventiveness of the pilots has many times resulted in characteristic Canadian mechanical equipment which is quite unique but nevertheless effective. As for example the no-dropper: a small machine or canvas shell open in front into which the nose of the aircraft may be pushed for the method of engine in submersible weather. By the arrangement of canvas curtains which may be drawn tightly about the fuselage behind the engine an enclosed protective space is secured in which a reasonably warm temperature may be maintained by the heat of a small stove that is placed therein. Even the fuselage equipment has in times of stress been put out of new blocks in airplane shops.

"THE WORK done by the service at the Northwest coast and almost every phase of commercial and industrial activity. In 1937 six conditions in Hudson Bay were under observation from three points which had been established on the Southern shore. Photographs from the air of the Bay of the ice pack and of the numerous points of interest surrounding Churchill, the terminus of the Hudson Bay Railroad, have added much to the engineering data required for the completion of this new harbor and railroad.

Of immense importance to the farming districts of the West is the work done to eradicate the wheat rust. Where flying is put on trial under the right conditions of clearing it has been found that the disease which so badly affects the crop is in the process of eradication. Similar methods are being tried with poisoning moths by the Entomological Branch of the Government as its investigation on the Pacific Coast of the White Pine blight rust. In Cape Breton forest clearing from the air to counteract the destruction caused by the spruce bud moth has been tried. Both wheat and forest diseases from the air are being combated with promising success.

The photographic program carried out by eight self-sustained detachments of two aircraft each covered no less than 65,200 sq. miles last year, of which 31,400 was

vertical and 38,800 oblique. The actual lineal area under fire patrol in the prairie provinces is now 61,021,911 acres.

"Because of the season in winter traffic in the United States and Europe and the growing public confidence in aviation brought about by the success of the Canadian northern expeditions, the Post Office Department found the time ripe in 1927 for the encouragement of air mail. In Canada the air mails are of the classes: those to remote and inaccessible districts served with difficulty and at considerable cost, and those linking our chief cities by fast air mail service. While the Lacrosse air service has succeeded in 1928 in providing an air mail passenger and express service from Hudson Bay to the newly discovered Itroga gold fields carrying 1,000 passengers, 73,000 lb. of freight and over 15,000 letters and telegrams, this service was discontinued with the construction of the railroad to Itroga, although much doing is still being done through this district and also the Chitko, Coppermine and other mining fields now being opened. In the winter of 1928 and 1929 the Red Lake mining field was discovered and later Hudson and Steno Lookout became busy air centers.

"Contracts were let for mail services to points on the shores of the Gulf of St. Lawrence in the Magdalen Islands to Anticosti and to the Yukon and Mackenzie valley. This service to the fully settled mining towns in the North has been fully justified and the benefits to these remote communities cannot be exaggerated. It is, however, a real effort to organize air traffic between the principal cities was undertaken.

"To provide the maximum benefit the daily air mail which now connects Montreal with New York and Montreal with Western Canada must operate at night. This calls for considerable expenditure of money for the lighting of airways, but the work is ordinary and inter-modern aerodromes spaced at thirty miles apart are being leased, become established and a radio direction finding system organized as aids to night flying by the Department of National Defense.

"Good communication to report the passage of planes and a good meteorological service are essential. This all requires time and money. The Department of National Defense and the Meteorological Office co-operate in this work. There are seven airports recognized as base airports for Western Canada. These are Winnipeg, Brandon, Regina, Moose Jaw, Medicine Hat, Calgary and Edmonton. All of these will have boundary and runway lights. There will be 8 other electric light beacons, 12 more aerodrome lights, 29 intermediate gas lights and 4 combustion light beacons where a change of direction is required, making a very big expenditure of light money in all. It is expected that the cost of this illumination for the 900-mile air route will be \$150,000.

"It is interesting that a branch air field has sprung off at the same rate at Regina and Steno Lookout and Edmonton will be started soon. These will operate on a 24-hour summer and winter schedule. Twelve air mail planes are expected to constitute a minimum requirement and made from illustration plans there will be a full complement of radio direction reproducers installed and operated in conjunction with the Canadian Air Force and the Civil Government Organization. The Royal Canadian Corps of Signals representing the Department of Marine.

"Judging from tests which already have been made it is hoped that a saving of 24 hours in the delivery of transcontinental mail will be achieved. Mail may be

taken from today's train in Winnipeg and delivered to yesterday's train at Edmonton.

"At the present a seagull service can be operated with fair efficiency from Montreal to Winnipeg from the middle of May until the middle of October, and the same may be seen from December 15 until the end of March on the St. Lawrence. The freezing and thawing periods involve interruption if water surfaces are used as aerodromes. Flying fields at regular intervals are necessary if an all-year service is to be operated. Ready made fields are not found through much of Ontario and their construction requires money and much labor on operation. In the West the expense is higher both for aerodromes and for planes. To overcome the high altitude and severe and reliable operating conditions over this difficult mountainous country, high performance aircraft with great reserve engine power must be used. The transcontinental route will be completed in the next few years, provided it has the support of the business communities affected.

"Avertissement new development in 1928 was the introduction of flying clubs. Statistics completed their organization and qualified the standard of pilots given by the Department of National Defense. The membership of the clubs is now 67,943, the total flying time 12,165 hours to Sept. 30, 1929, 26 private pilots and 40 commercial pilots' certificates have been issued to members. There are 829 air mail schools. Apart from the actual flying training these clubs have been of great assistance in educational work. Interest in flying has been increased and good aerodromes have been constructed and are maintained in many centers.

"A tour of inspection of prospective routes was recently made, which considered from the standpoint of efficiency in operation under different flying conditions. It can be compared with any in history. Not a record flight, but one serving a strictly utilitarian purpose, the flight was made via Norway House, Fort Churchill, Churchill, Inlet, Baker Lake, Abitibi, Lake Abitibi, the Northern Lands, down the Mackenzie to Lake Athabasca, eastward by the Red River to Winnipeg Lake, down down Red Lake and Red Lake to Churchill and on to the Prairies, in twelve days with 29 hours actual flying time. Prospect stops were made to observe en route. It is a great through flight of this kind of patient effort, energy and initiative of the personnel that the aeroplane has come to be so essential in modern travel throughout Northern Canada. It is hastening the development of many districts by at least a generation.

"A summary of the present airplane operations in Canada shows the service to the Government of Northern Canada for air transport in such a way as to bring its present part with a day or two of civilization, this power period of ten years in aviation has achieved co-operation between various services, Federal, Provincial and private in the administration and protection of a vast range of our mountain forests in the service of a quarter of a million miles, in the preparation of forest remedies by air stretching, in the protection of the forests, in transportation to inaccessible districts, in investigation of sea conditions in Hudson Bay and in many other operations. The aerial tests have been taken for the organization of air transport routes between the principal cities of the Dominion, with connections to the United States to the end that mails, express matter and eventually passengers may be transported as freely as by road, railway or steamship."

THE FEDERAL BUDGET AND Aeronautics

An Analysis of the President's Recommendations for Aeronautical Expenditures for the Coming Year

THE BUDGET of the United States, presented to Congress by the President with a special message at the opening of the annual regular session each December, makes a volume weighing five pounds. It comprises seven-hundred headed pages of solid statistics, and to get a half-way view of the whole document would require a somewhat formidable task. The President's message is a summary of the more important items and proposed changes, but the reader with a specialized interest wants to go deeper, and the specialist in aeronautics finds that he must also consult with the Budget estimates of every point.

Of the two Federal Departments, six are directly concerned with aeronautics and make substantial expenditures in that field. Army and Navy have their own air forces. The Post Office Department estimates for payment to air mail contractors. The Treasury Department operates aircraft in the service of the Coast Guard. The Department of Agriculture maintains the Weather Bureau, with its aerological and forecasting service. The National Advisory Committee for Aeronautics takes high rank in importance among the independent establishments entirely outside the regular executive departments. As yet, but of seven men appointed to the post office of aerology, the Department of Commerce not only carries on its regulatory activities and its airway development work, but is also responsible for better manufacture and investigation, and for safety aeronautical researches of the Bureau of Standards.

In the necessarily brief message with which the President transmitted the Budget, he confided his remarks upon civil aeronautics to the observation: "We are also spending large sums for lighting and equipping airways, the inspection and licensing of commercial planes and pilots, and furnishing weather reports necessary to the carrying on of aerial navigation. For these purposes, there is included in the estimates of the Department of Commerce \$2,625,830. It is estimated that by the end of the fiscal year 1931 there will be about 34,400 miles of airways lighted and equipped." The slightly more comprehensive definition in the general synopsis of outlays of appropriations is the worthy of direct support. "For aeronautics the estimate amounted to \$2,809,210 more than the appropriations for the current year. Two hundred seventy-three thousand eight hundred thirty dollars of this amount is for pay and expenses of additional inspectors personnel for rapidly growing re-

quirements under inspection and licensing of aircraft, pilots, and mechanics, and for the overhaul and replacement of 9 of the 26 places used in the inspection service. The increase will also provide for examining and rating aeronautical schools as required in the act of February 28, 1929. An increase of \$2,235,380 is included for maintenance and operation of lighted airways to be in operation by June 30 next, the construction of 3,000 additional miles in 1931, and its maintenance and operation for a part of the year. The program also includes a considerable extension of the teletype system of weather reporting.

In making this message, and also the detailed figures which accompany it, it must of course be remembered that the Budget is only the preliminary project of appropriations. It is the recommendation of the President, which Congress may follow or dissent at pleasure, but the final rule has been to adhere closely to budgetary appropriations at most points. It may, therefore, be taken as an approximate but reasonably close forecast of what the appropriations will in fact contain.

It must be remembered, too, by those not saturated with governmental bookkeeping practice, that all allocations of governmental funds are referred to the fiscal year ending on June 30. Wherever there is reference to appropriations for 1930, therefore, the period actually covered is from July 1, 1929, to June 30, 1930, and the same rule holds for every other year.

PROCEEDING to the more detailed breakdown it develops that the recommended appropriation for "aerocraft in commerce," which covers the regulatory work of the Department, is \$1,251,830 as against \$958,000 for the fiscal year which will end on June 30 next, an increase of \$273,830. For air navigation facilities and airway development the amount allocated had been increased from \$5,486,630 to \$7,094,000, an increase of \$2,235,380.

While the Budget does not give a complete breakdown of the purposes to which sums are to be allocated, it does list all principal and important service institutions. For "aerocraft in commerce," there is provided \$5,000 for the purchase of airplanes for the use of the inspection force. For the present year the Department had been specifically limited to the purchase of five new planes, and the proposed allocation for 1931 will permit of acquiring approximately that number.

The inspection force and the official staff in Washington

use to be substantially increased under the new estimate. During the fiscal year 1929 there had been an duty to average 124 employees in Washington and 96 in the field (not including any of those engaged upon airway development work). The appropriation bill for the present year permits increasing those numbers to 129 and 92, leaving the total staff practically unaltered. For 1930, however, increased to 137 and 121, respectively, are proposed. The changes in Washington will be primarily clerical, and the most important increase in staff is in the field-inspection force, the number of aeronautical inspectors, since that post, being raised from 51 this year to 41 next, and 40 next year, is to be added to the present force of eight. Of the total budget for aircraft in commerce \$748,500 will be allotted to salaries of employees.

By same components of the laws and practices govern transportation left unchanged, the pricing of airway maps, for which an appropriation of \$9,000 is again recommended as during the present year, appears under the heading of "Aircraft in Commerce." All other airway activities are under the subheading "Air Navigation Facilities."

AIRWAY'S BUDGET arrived awaiting for new airplanes for the army experiments. This year there is a specific proviso for the replacement of not more than three machines. The major part of the appropriation, however, goes for new airway equipment and for personnel. The aircraft, like that for the navy, has shown a pronounced increase in number of employees. The total has risen from 840 in the fiscal year 1929 to 1,360 this year and an estimated aggregate of 2,387 in 1931, a fairly staggering figure. Of that total, however, approximately two-thirds, 1,654 in all, are fixed as airway keepers and controllers, and 1,084 of them are to be paid \$800 a year or less, while 600 will get only \$120 a month for their services. The racks of the controllers account for three-quarters of the total proposed increase in personnel.

The rapidly increasing importance of radio in airway work is suggested by an increase in radio personnel from 123 in 1929, including 226 operators, for the fiscal year 1930 the total radio personnel was only 89. The growing importance of the meteorological work done directly by the Department of Commerce is shown by a proposed increase of the number of weather observers from 50 to 80. The significance of communication along airways (it will be recalled that the general analysis called special attention to the increasing invasion of telephone service) is evidenced in its actual allocation for telephone and telegraph charges from \$250,000 to \$600,000. "It is a very large increase made in preparing the budget for the present year was even larger, for in 1929 the aggregate amount expended for communication was only \$51,000.

It is of some interest to compare the expenses of the Federal Government upon communication with the annual budget in farming and in controlling other types of transportation service.

For the federal aid highway system, the approximate expenditures of the Federal Government during the present year are to be \$97,000,000, and the estimate for 1931 is \$100,000,000, representing an increase of 3 per cent devoted to survey construction and maintenance. Navigation facilities by the work of the Bureau of Lighthouses, for which a total of \$11,307,700 is estimated for next year and by that of the Coast and Geodetic Survey, which devotes most of its efforts to preparing ocean and

harbor charts and which is recommended to receive \$29,011,304. The Smithsonian Institution, the Bureau of Navigation have activities corresponding to the work of registration of aeronautics, and they are estimated to receive together a total of \$17,700,655, or about 45 per cent more than is to be devoted to the regulation of aircraft.

Against the expenditures upon aircraft regulation there have to be offset the fines and penalties collected for violations of the air traffic regulations. During the fiscal year 1929 those amounted to \$4,200. For the present year the estimate is \$6,000, and for 1931 \$8,000. There are no other receipts in the work of the Aeronautics Branch is of course those without changing any law. In this respect the practice differs from that of the Bureau of Navigation, for which there is provided an income during the next fiscal year of \$50,000 from penalties for violations and \$200,000 from fees to the Bureau for examinations and licenses.

Although the Department of Commerce maintains the airway, has in it employ a certain number of weather observers, and to employ the means of communicating weather information along established routes, the main task of providing meteorological data is left to be done by the Weather Bureau. For 1929 the Weather Bureau's expenditures aggregated just under \$2,036,000. The appropriation for 1930 was \$3,462,000 and for the coming year the estimate is \$4,056,000, and practically all of this increase of more than \$1,000,000 or possibly 40 per cent in two years, is due to the demands of air transport.

The entire increase in the estimate for the coming year will be devoted to the opening of new observing stations and their maintenance. The number of full-time employees in the field is to be increased by 116, and provision is made for the Weather Bureau to employ 553 special observers on a part-time basis, in place of 211 as during the present year, or 55 last year. While it is impracticable to say exactly how the Weather Bureau's appropriation is divided between service to aviation and other activities, much of it will be paid to stations with special reference to airway service.

THE AIRWAY upon which transport aircraft travel are planned by the Department of Commerce and are made up with the cooperation of the Weather Bureau, but the major part of the income for operating over these routes is to the transport companies through the Post Office Department. The department makes no separate estimate of the income from air mail and other types of postage, and it is therefore impossible to say just what the net cost of contract air mail is to be estimated to be. The total amount recommended for the domestic contract air mail service is \$15,000,000, and against that should be set the full revenue from air mail postage. A little more than \$90,000 of this amount goes into the employment of air mail officials in the post office department and into involving revenues and other considerations, \$14,948,250 remains available for the actual transportation of domestic air mail by contract. For the fiscal year 1930 the corresponding figure was \$14,250,340 and the actual expenditures during 1929 was \$16,000,015. The estimate for the present year is an increase of 39 per cent over its predecessor, while the estimate for the coming year provides for a further increase in payments to contractors of 33 per cent.

A total of 20 officials of the Department 17 of whom are located in Washington, are specifically assigned to

the supervision of air mail service as their principal duty. A more substantial account has been provided in the sum available for handling foreign mail by air. Compared with an appropriation of \$4,300,000 for the present year, the new budget estimates for 1930, at \$5,000,000, an increase of 16 per cent over the present year, and for 1931, at \$5,500,000, an increase of 10 per cent over the present year, will thus be a total in excess of \$23,000,000.

ON a whole count to realize the extent of its dependence upon research and to have a due appreciation of such work as that done by the National Advisory Committee for Aeronautics at Langley Field. The industry's increasing interest and appreciation have been reflected in increasingly important contributions to the work of the Bureau of the Budget. For the coming year the Budget provides for the National Advisory Committee a total of \$1,321,300 as against an annual appropriation of \$1,500,400 for the fiscal year 1930 (including deficiency allotments) and in equivalent of \$624,550 for 1929. The increase covers the last two years represents in part the expanded scale of the general research work, but is intended primarily to provide for new buildings and major additions to the research equipment. Of last year's appropriation \$525,000 was for the making of a start with the new wind tunnel, followed by the purchase of \$208,000 for the work for spinning turbine models, and \$308,000 for a garage, while in the coming year \$375,000 are set aside in the estimate for completing the wind tunnel and \$60,000 for a new hangar at Langley Field, leaving \$871,000 for the prosecution of current research.

The expanding scope of the Advisory Committee's studies is shown in the personnel list, the total number of employees outside of Washington, almost all of them at Langley Field, having been 169 for 1928, 206 for the current year, and 236 estimated for 1930. Of that total of 236, 107 of them at Langley Field are to have scientific training, the remainder being made up principally of mechanics for the hangar and the shops and of clerks. Forty to a employees in Washington give the committee a total staff of 288.

THE military and naval services and the Coast Guard make direct contact with the aircraft industry primarily as purchasers of its products and industry priority of their allocations has been left almost to the last.

The Army and Navy are both still proceeding toward the completion of the contract program created into law in the summer of 1926. The Navy gained a year in the Army in the very beginning and still holds that advantage, so that the air arm of the sea service is now making provision for the last of the five aerial increments, while the Army is approaching the fourth. Summarizing the result of the coming year's negotiations if made in accordance with budget estimates, the President's message read: "Under the air service program for the Army and Navy I am asking for a total of \$33,000,000 for the procurement of airplanes, their engines, spare parts and accessories. With regard to the Army, provision is made for the procurement of 443 airplanes pertaining to the fourth increment of the five-year program authorized by Congress. This program calls for 1,515 planes to be on hand or on order on June 30, 1931, and it is believed that this goal will be reached more closely approached by the very already appropriated and the amount estimated in this budget. The present shortage in the program is about 40 planes pertaining to

prior increments. No amount has been specifically included in the 1931 estimates to make up this shortage in view of the possibility of its reduction or complete elimination before the final increment is reached. Concerning the Navy air program, the last or fifth increment of the five-year program authorized by Congress will be reached in 1931. This program contemplates about 1,000 planes and two airships to be on hand and upon order at the close of that fiscal year. To accomplish this provision is made for the procurement of 250 airplanes, and 100 other equipment, and for continuing the work on the two airships now under contract." It will be recalled that the Army's five-year program provided for the ultimate availability of 1,400 airplanes for that service, the figure 1,515 mentioned by the President being the point that was anticipated to be reached at the end of the fourth year.

The Navy's program needed only an estimate total of 1,000 which should be attained by purchases allowed for in the five estimates.

The Navy's program, unlike the Army's, authorized the purchase of a specifically stated number of airplanes in each fiscal year, the total to be acquired aeroplanes rising from a minimum of 213 in each of the first two years to a maximum of 274 in the last year. In only one of the four years that have so far elapsed has the number of planes purchased actually fallen short of the original authorizing act and it will be noted that for the coming year the actual purchases are estimated at 269 airplanes in place of the 274 authorized. The fact that the total will be reached on time therefore represents a substantial reduction in the number of airplanes before the 33 per cent usually originally estimated, with a corresponding reduction in the number of machines that must be purchased to attain the desired goal on time.

Turning to the military estimates in more detail, it develops that the actual air arm available to be used obligated on the purchase of airplanes is greatly augmented and some parts are of the Budget is followed, to be \$17,573,723 for the Army Air Corps and \$11,033,800 for the naval arm, as against \$36,189,280 and \$14,215,000 respectively for the fiscal year 1930. The War Department's estimate for the coming year is \$18,500,430 for airplanes and equipment, while the Navy is to receive \$18,000,000 for continuing work upon the rigid airships now under construction by the Goodyear-Zeppelin Corporation.

The Navy's appropriation bill, which allocated two and a quarter million dollars for experimental and research work in 1930, as drafted by the Bureau of the Budget places no definite limitation upon the part of the total appropriation that may be assigned to these activities in 1930. The aggregate appropriation recommended is \$35,622,473, and except for the specific allocations to new equipment already noted there is no important limitation upon the freedom of the War Department in expending these sums for such aeronautical purposes as appear most important. The Army personnel estimates provide for a total of 2,653 civilian employees outside of Washington as against 2,356 in 1930, the largest increase being in the numbers of mechanics and machinists.

The Navy gives no detailed personnel estimates for its field stations in aeroplanes, but does have its appropriation more closely subdivided. The allocation for maintenance of military aircraft equipment is estimated at \$11,044,290, including \$3,000,000 for salaries against \$12,240,000 including \$2,900,000 for salaries in

1930. Approximately 34 per cent of the total amount of maintenance goes for the upkeep of the aircraft with the fleet and the majority equipment, the remainder being expended above.

The maintenance appropriation for 1930 was substantially increased over that for the previous year, when the total had been a little less than \$10,000,000. Up to that time a shortage of maintenance funds had always been acutely felt.

The recommendation for appropriations for experimental work in naval aeronautics limits the amount disbursed from this year's provision of \$1,000,000. The allotment for instruments, including photographic equipment and radio, is cut from \$1,135,000 to \$1,124,200, in correspondence with the reduction in the anticipated outlay for new aircraft in which instrumental equipment will be required.

In the aggregate, including the sums encumbered and some others of lesser importance, the naval budget carries \$242,330,000 as interest of just \$800,000 over the previous year.

BOTH the Army and Navy carry Reserve aviation under a separate heading in their appropriation bills, except that airplanes are provided out of the general appropriations for the purchase of new aerial equipment. From the Navy's funds for that purpose there are set aside \$197,700 for the fiscal year 1930, and \$200,000 in the August \$274,000 for the present fiscal year. It is impossible to determine just what part of the Naval Reserve appropriation is to be used for pay for aviation personnel, but for maintenance of material and purchase of supplies the amount estimated is \$832,935, in against \$882,931 for 1930. This reduction of about \$50,000 for maintenance and \$66,000 for new airplanes may not demand any actual reduction in activity, as the appropriation for 1930 corresponded to a period in which a number of new squadrons were being organized, with new planes to be purchased for their initial equipment and with correspondingly high expenditures likely to accrue in the initial period of their operations.

The War Department's Reserve appropriation, unlike the Navy's, includes the purchase of a certain number of airplanes. The aggregate estimate for airplanes for the current year is \$1,326,796, an increase of \$90,499 over 1930 and of \$301,850 over 1929. The War Department appropriation estimates are not so classified as to allow of any estimate of expenditure upon maintenance of Air Corps Reserve equipment or squadron operations.

In awareness, for public works, or the construction of headquarters, flying fields, etc., as to a number of other matters, the Army's appropriation bill gives a much greater degree of freedom than the Navy's. The War Department will receive some \$27,000,000 to be expended by the Quartermaster General in accordance with outstanding acts of authorization, but without detailed allocation to separate projects. Of the \$7,500,000 allotted to all rural public works for the coming year, according to the estimates, \$1,891,600, or eighteen per cent, is assigned to airport air stations. The airport station at Lakeside, the first field at Annapolis (a suburb of Washington), and at Hampton Roads, and the station at Sand Point near Seattle are all to be minor headquarters, if the estimates are approved by Congress, but the major expenditures are made through for the existing station at Pensacola, for San Diego, and for Ford Island, Honolulu. Substantial amounts of money are to go into the improvement

of surface conditions on flying fields, a total of \$364,000 being recommended for that purpose to be distributed among four stations. Most of the expenditure is proposed for such activities as power plants and water supply systems, but the Hawaiian station is recommended for a considerable expenditure on new hangars. This item becomes of special interest because of its relation to the unresolvable and as yet unsettled dispute between the Army and Navy over the use of Ford Island, where a refinery and a naval air station at present exist side by side upon an area which is constantly felt to provide hardly room for either or alone. Needed expenditures at Ford Island have been long delayed, the Congress refusing to authorize them until some settlement of the future disposition of the area should have been arrived at between the services.

The appropriation for naval aeronautics and the Air Corps do not include any allowance for salaries of civilian personnel in Washington. For the Bureau of Aeronautics there is recommended for the coming year a total salary list of \$387,330 covering 123 employees, while the office of the Chief of Air Corps has an allotment of \$241,585 for 123 employees. The Navy's figure shows potentially no change from the previous year, the Army's an increase of some \$14,000 and six employees. The condition in the two branches are not strictly comparable, however, so much of the work which is handled for the Army at the Military Division in Dayton, Ohio, and which is appropriated for under the field service as the present Air Corps appropriation, is directly taken care of in the Bureau of Aeronautics in Washington by the Navy.

A COURT of minor items remain. The Treasury Department's estimate totals \$320,000 for new uniforms for the Coast Guard. There had been no corresponding appropriations for 1930. For helmet production the Bureau of Mines is scheduled to receive \$170,000, the same amount as in 1928, that sum being owed by the Army and Navy to return for the helmet plan. For helmet design there from the Bureau of Mines plan. For helmet investigation there is a provision of \$75,000, an amount again unchanged from the previous year, while the total amount estimated for helmet plan is \$206,190, of which \$293,200 will be secured in additional purchases of land and some of the cost of the helmet plan. Last year's total of almost exactly \$1,400,000 had gone into helmet plant construction, including \$836,000 for land and leases thereof.

It would be futile to attempt any summation of all the miscellaneous expenditures. The dividing line between aeronautical and non-aeronautical appropriations, or between direct and indirect expenditure for aeronautical purposes, is not and cannot be sharply drawn. Thus, for example, the appropriation for the Air Corps is estimated at \$35,823,473, but it is pointed out that the estimate includes an additional provision for Army provision of \$36,296,825 under other appropriation headings, covering the pay of personnel, the general maintenance of the Reserve, etc. It would measure the direct appropriations for aeronautical purposes crediting against the total amount the possible receipts from air mail postage and the other indirect activities which amount to \$19,000,000. The direct and indirect, or the total outlay of the government immediately related to and dependent upon its aeronautical work, total about \$180,000,000, approximately six per cent of the total net expenditures of the Federal Government, not including amounts devoted to reducing the public debt and paying interest thereon.

THE *Airport* POST OFFICE

By HOWARD HUYLER MEANS

SPEED in the mail must be insured by speed on the ground, as the proper handling of air mail. And to addition to speed and efficiency on the part of the air department and the ground department, as separate operating units, there must be, of course, perfect co-operation between the two.

During our discussion of ground work to that involved in the mechanics of transmission of an airmail, the focal point of these two departments lies in the airport "post office" officially designated as transfer points—the comparatively obscure distribution agent for securing and outgoing mail matter.

There are a number of these airport postal offices at such busy ports as Athens, Chicago, Cleveland, Omaha, Newark, Ceres Field, Chicago, Mexico Field, New Orleans, St. Louis Field, San Francisco, and Salt Lake City. Typical of all these is the unit at Candler Field, Atlanta, which serves as the transfer point for Contract Air Mail routes 22, 23, 25 and 30. Like the others, it is in evidence as a result of a Post Office Department policy, established in 1927, to provide "on-line" transfer points at air and terminals where volume of traffic is sufficiently heavy.

An airport post office building became a necessity, according to Postmaster Edwin K. Larp, of Atlanta, and so a steel structure, standing on a concrete foundation and measuring 260 ft. by 100 ft., was erected by the City of Atlanta at a cost of \$6,190 in 1928. The building, which houses the telegraph, telephone, and radio stations, was completed Oct. 1, 1928 and was designated as the Government Building.

The roof to the Post Office Department of engineering and furnishing the Candler Field office is estimated at \$11,000. Elevator shafts of shafting, 3 ft. wide and 4 ft. high, have been installed to meet the present requirements. Each unit contains 50 pigeon holes. A Toledo "post office specification" scale of 2,000 ft. is especially used for weighing mail, received and dispatched. Six small scales, provided in cages, are used to weighing individual pieces to ascertain if correct postage has been affixed. Private telephone service to the main post office in the down town section and to the office of the Chief Clerk of the Railway Mail Service in the railway terminal station is provided also.

When Candler Field first began to handle air mail the



Handling the mail at this post office located at Candler Field, Atlanta, Ga.

sorting and preparation for forwarding by plane or train would be done by four clerks in cages provided in the Post Office Aviation Company's hangar. When these activities were transferred to the Government Building, seven men were given a distributor. At present there are two clerks in charge of mail distribution, the supervising clerk of the Railway Mail Service. In comparison, increases in air mail service reducing from Atlanta one about twice at the proposed twice daily New York-Atlanta service and new shuttle operations between Atlanta and New Orleans and Miami—further services in postal personnel will be required.

IT IS EASY to appreciate how vital a part the transfer point plays in the transmission of air mail according to schedules which call for close observation by considering the ramifications of the aerial lines converging at Atlanta.

There is the C.A.M. 19, which is an overnight service between Atlanta and New York (operated by Pan American Airways); C.A.M. 23, which is the Atlanta-New Orleans route (Southern Air Transport); C.A.M. 25, which is the Atlanta-Miami line (Pittsburgh); and C.A.M. 30, which is the Atlanta-Chicago route (Interstate Air Lines).

Close observation at transfer and terminal points between planes and between planes and rail tracks, is one of the features of the whole air mail system, since schedules are made out with greatest possible speed as the common goal of all elements involved. To meet these schedules, speed and accuracy are required in the airport post office. For instance, the scheduled arrivals at Atlanta for planes over routes 30, 23, and 25 are 6:25, 6:30 and 7 p.m., respectively. The average mail load on board the three planes on their arrival at Candler Field is usually about 150 lb. or more than 12,000 pieces. From two-thirds to three-fourths of this amount is bound for points in Pennsylvania, New York and the New England States. Promptly at 7:30 p.m. all the mail is ready to be loaded, allowing the New York plane to depart on schedule.

Such a service as the above would not be possible without adequate postal facilities at the airports through which the mail must pass.

By HAZLETON MURKIN.



AIRCRAFT Owner Liability UNDER THE LAW

THAT PART of the Uniform State Law now promulgated which is likely to affect most immediately the owner of commercial aircraft of whatever type, is the section which provides that the owner of every aircraft is absolutely liable for injuries in person or property caused by the aircraft, descent or flight of the aircraft whether such owner was negligent or not. This law has already been adopted by the legislatures of a dozen or more states and in the natural course of events, is likely to find its way into the statutes of others in the near future.

To the owner, or to one who has leased a plane for his use, it might seem that this section of the Uniform State Law is of decided importance because it offers him no escape from the payment of damages caused by his plane, even though they result entirely through the fault, no matter how gross, of someone else provided, of course, that that someone is not the person injured or the owner of the property which is harmed. It may be some consolation to the owner to be able to obtain an insurance policy to cover these damages but after all, this is begging the question and, in any event, the enforceability of this provision of the law would be reduced to the promise which he would be obliged to pay.

When a lawyer speaks of "negligence" as a branch of the law he refers to the body of the law covering civil, as opposed to criminal, liability for injuries caused to persons or property through wrongful acts, be they intentional or merely the result of failure to observe ordinary reasonable care.

An almost universal feature of the law of negligence is the requirement that there can be no liability without a corresponding fault, although in this general rule there are exceptions. One of these—perhaps the outstanding one—is that which provides that when the use of a particular instrumentality is attended with such extraordinary risk that it is, in itself, as he charged as inherently dangerous, the only care in its use which may be regarded as sufficient, is such care as shall operate to prevent injury.

By other words the user of such an instrumentality is made, under the law, an insurer against damage however

caused. It is this exception to the general rule which has been incorporated in the law governing the ownership and operation of aircraft of those states which have accepted the Uniform State Law and, by this legislation, aircraft in those states have been put in a class of property most dangerous to own after explosives, corrosive acids, lethal gases or any of the numerous things popularly regarded as dangerous but the ownership and use of which, as far as the law of negligence is concerned, must be considered, at most, only by the employment of all having means in practical use to prevent damages to others.

THE UNIFORM STATE LAW was adopted in the first instance in 1923, and it is not to be doubted that, as far as the section providing for the responsibility for damages is concerned, those who drafted it were influenced by the Air Navigation Act adopted in England in 1920. The corresponding section of the English law is somewhat similar but with this very important difference, that by its provisions, damages are recoverable from the owner without proof of negligence by the one injured. In the opinion of two of the best known commentators on English law, in addition to aircraft, this establishes the rule of *res ipsa loquitur*—a thing speaks for itself—and, if so, the English law simply shifts the burden of proof from the one injured to the one causing the injury and makes it necessary for the latter to claim the satisfaction of the court or jury, as the case may be, that he was not to blame. This is a far different matter from basing liability upon him regardless of his fault or even when the true cause of the damage is one of those accidents or chains of circumstances so far beyond the control of anyone that they are known to the law as "acts of God."

When the authors of the Uniform State Law approached the subject of damages, it is probable that they had before them also, the decision in a very early case affecting balloons decided in New York in 1827. No doubt they were familiar too with a case adjudicated in Belgium in 1900. In the former case an aeronaut descended in a balloon in the presence of some two hundred spectators who broke through fences and trampled down

the vegetables and flowers. The balloon, in descending, did more small damage itself and the owner admitted his liability for that, but the court held that he must pay for all the damage done by the crowd as well. A German case went so far as to hold a balloonist liable for damages caused by a crowd to flowers trampled by them in rushing the better to see a balloon which was far beyond the gates.

The Belgian case of all cases concerning any feature of the law of aeronautics is, perhaps, the most remarkable in its facts. There a balloon began to descend near a small town by reason of loss of gas. The pilot, desiring a forced landing, chose a small open space beyond the town limits. As he was blown just above the roofs of the houses with his ropes dragging in the streets, the townspeople, thinking that he wished to be drawn down, seized him, and in spite of his efforts to communicate his desire to be released, he was pulled toward the ground. In an effort to facilitate matters, he valued a quantity of gas. In the second story of a house a crowd was smoking; his agonized shouts the escaping gas and the resulting explosion killed and injured a number of persons and destroyed property in the vicinity. The unfortunate aeronaut was obliged to pay for it all. The report of the case does not disclose the circumstances under which he escaped what would doubtless be considered the worst fate of his unfortunate ground crew.

THE RISK OF INJURY to persons or property whether by loss of profits or far gone, such damages as the courts have been harsh to the point of negligence. Yet, under the Uniform State Law such decisions will be forced upon the courts, and no judge, no matter how progressive, will be able with such a statute confronting him, to vary the hard and fast provisions of its language. It is for this reason that the movement of legislation upon points of substantive law is dangerous. Far better that such matters be left to the courts where existing principles of law may be expanded to meet new conditions as they develop. From the standpoint of aviation the proper function of state law making bodies, the majority of whose members are neither aeronauts nor lawyers, is at most, the regulation of the housing of aeronaut and aircraft and of the con-

Mr. Mirkil is rather uniquely qualified to present his viewpoints on the subject of aircraft owner liability under the law in view of the fact that he is intimately acquainted with both the law and aeronautics. During the World War, Mr. Mirkil was an Ensign in the United States Naval Reserve Flying Corps, and served as instructor in aerial navigation at the Naval Air Station, Pensacola, Fla. He is a member of the American Bar Association, the Pennsylvania Bar Association, the Law Association of Philadelphia, and the Air Law Institute.

struction and maintenance of airports and landing fields and the establishment of air traffic rules.

The ideal function of such bodies at this early point in the development of aviation, is the establishment of commissions of experts with authority, as expressed in the law adopted by Virginia—

"To promulgate such rules and regulations relating to air traffic, construction and inspection of aeroplanes, qualification and licensing of air pilots, mail flying, and such other related matters and things . . . as may be deemed proper and necessary to promote and develop safe traffic by aircraft; provided such rules shall conform to and coincide with, so far as possible, the provisions of the Air Commerce Act of 1926 . . . and the air traffic regulations . . . issued pursuant thereto by the Department of Commerce."

It is seriously that such commissions will establish any rules which will obstruct the proper development of aviation. Should they do so, their rules are infinitely easier of amendment than are the laws enacted by a legislature. In Connecticut, under a law enacted in 1911, "every aeronaut was held responsible for all damages." In 1927, the law of that state was changed to provide for liability for damage resulting from the negligence of the pilot; and Massachusetts when, by the Act of 1913, it was provided that an aeronaut should be liable for injuries unless he could demonstrate that he had taken every reasonable precaution to prevent them; by a number of acts such amendment or repealing the preceding one has abandoned all reference to the question of negligence and, by inference, has set up the ordinary rules. These two examples confirm the thought that flightless means unreasonably limited the domain of absolute liability. There is no instance of the doctrine having been established where such the general rule has been affirmatively set up.

PLANE AND GROUND

COMMUNICATION BY *Radio*

By FRANK L. CURTIS

A Brief Study of the Pan-American Radio System and Its Development

A FORD tri-engine transport with ten passengers was flying from Tampico to Mexico City on a regular scheduled run of Pan-American Airways. Before leaving Tampico the pilot had received an all-clear weather report from the company's central weather station at Mexico City.

Two hours out, after the plane had crossed the mountains and was coasting down into the interior, the Mexico City station flashed a storm warning. A Mexican bomber was sweeping directly across the path of the airliner. To proceed would be dangerous.

Officials at the base in Mexico City decided to order a landing. The operator signalled to the plane, more than 200 miles away, by radio:

"Land at field 'A' and await further orders."

In a few minutes came the reply:

"We are in the mountains. Will land as soon as possible."

Later the following was received:

"Landing at field 'A'. I am coming in."

For fifteen minutes there was silence. Then came a faint signal, gradually increasing in volume:

"Landed safely. Waiting orders."

The operator had raised his antenna from the plane to a tree and was again in communication with the base.

This happened Sept. 1 last. It was merely an incident in the regular operation of an airline and not news, so the newspapers did not mention it. But to aviation generally and Pan-American Airways in particular it was one of the most important events of the year.

It was the first practical demonstration of aircraft radio as insurance against extra dangers. To the company it was the first dividend on an investment of approximately \$1,800,000. It prompted the time when all transport planes will be protected by a radio weather system and storm and fog will no longer be a menace.

Further than that, it foreshadowed the day when all aircraft, large and small, will be radio equipped, like ships at sea. A statement bearing the date, Sept. 1, 1929, should be etched on that closing in the Sierra Madre Mountains as a reminder of the days when even the best plane and pilot was not safe from weather, hazards.

THE PAN-AMERICAN'S COMMUNICATIONS system is considered the best in the world today, although several other air transport companies are developing systems which when perfected should be as good.

Pan-American's temporary superiority in this field is due to necessity, which in this case, was truly the mother

of invention. Because of the fact that the company's planes fly over many different countries and a region beset with some of the worst flying weather on the earth, a 100 per cent effective weather communication and navigation service had to be created.

Two years ago the directors decided to spend any amount of money needed to build up a radio system that would function under all conditions and make flying in the West Indies and Latin America safe.

By arrangement with the Radio Corporation of America, which had then made some progress in the development of aircraft radio, but had not perfected it, the Pan-American organized its own laboratory in Miami, and began an extensive series of experiments.

H. C. Leuteritz, the company's chief radio engineer, who has recently been at the International Radio Conference at the Hague as the representative of American aviation, was in charge of the work. Mr. Leuteritz had previously had several years of experience in the engineering department of the Radio Corporation.

His instructions were to create a system of communications over a territory larger than the United States, covering land and water, which would provide a maximum amount of safety to passengers, mail, pilots and planes flying on schedule over cluttered routes.

THE FIRST STEP WAS TO construct a network of ground stations on these routes averaging 250 miles apart. The Radio Corporation gave the Pan-American permission to build its own ground stations, using, to some extent, the R.C.A. equipment. The stations had to be capable of constant communication all seasons of the year with each other and with one or several planes in the air between stations.

During the rainy season the constant prevalence of storms, together with the adverse conditions encountered in the tropics, made Mr. Leuteritz's problem extremely

Of all the problems confronting the air transport operator, perhaps the most important is that dealing with radio ground-to-plane and plane-to-ground communication. Pan-American Airways has played a leading part in the task of solving airline radio problems, and as a result its system is considered to be the best in the world today, although several other air transport companies are developing systems which when perfected should be as good. This article tells in detail of conditions encountered by Pan-American engineers and of the equipment and system developed under the personal supervision of H. C. Leuteritz, the Company's chief radio engineer.

difficult. The chief problem, of course, was the two-way set to be carried in the planes. It had to be compact, light and effective under all conditions.

One of Mr. Leuteritz's first important decisions after experiments had been conducted with telephone was to use telegraph rather than telephone. Telegraph equipment was lighter and its range greater, although it meant



The compact two-way radio set developed by H. C. Leuteritz, chief radio engineer of the Pan-American Airways. The apparatus weighs 15 lbs.



One of the Pan-American Airlines Ford V-8's, equipped with receiving and transmitting apparatus allowing the radio system.

carrying a trained telegrapher on each plane. Another significant factor for the telegraph was the fact that errors in transmission are less likely to occur.

This point decided, Mr. Leuteritz went to work. Every possible arrangement and combination was tried out for installing the set in the planes. It was finally decided to put the apparatus, with the exception of the receiver in the tail of the ship and sent the operator in the front right hand seat in the passenger's cabin. The transmitter is remote controlled. Antenna reels are operated by hand.

Most come the problem of building a set that would function properly, without being too bulky. This of course, is what every aircraft radio engineer has been working on for years. After months of experimenting a set was developed which seemed satisfactory.

For Avionics, according to company figures, the radio set service functioned 99.4 per cent. Against the height of the rainy season and the worst month of the year for static.

Much of the development on the set has been accomplished in the last 12 months. Low power transmitters have been used consistently during that time. The original units used one 21-watt tube employed in the Armstrong circuit. The entire circuit, with its associated

wiring in a self-exciting circuit of the Hartley type furnishes the power.

The high voltage for the plate circuit of the power tube is obtained by using two vacuum vapor rectifier tubes fed from a high voltage transformer producing 3000 volts on the secondary side. The rectified 3000 volts is smoothed by a variable condenser.

All circuits have a power rating well above the figure they are required to work on in order that a maximum frequency stability may be obtained in the output signal. The ground transmitter covers a wave length band of from 35 to 60 meters by merely turning one dial from zero to 100 degrees and good efficiency is obtained over the whole scale.

The transmitter is self-contained and when completed the unit is ready for operation by simply plugging into a 110 or 220-volt A.C. single line. Two types of transmitter have been built exactly alike in every respect, one for 110 volts and the other for 220.

The 250 watts of radio frequency energy are fed into an antenna known as a horizontal doublet, which consists of a horizontal wire suspended between two masts averaging 40 ft. in height. Ground stations are adjusted to operate on a wave length of 54 meters. Standard R.C.A. commercial receivers are used in the ground stations.

It was necessary to entirely redesign the transmitters for airplane installation. A new type was put into use last July. The coil system and vacuum tube were separated, both plugging into a sub-panel, which was mounted on top of the dynamometer unit, but shielded with springs at each corner. After adjustments and refinements, this transmitter obtained good frequency stability on 54 meters with a pure tone. Long wave coils worked equally well.

In order to improve the frequency stability and increase the power output another transmitter was built using 21-watt vacuum rectifier tube and another tube of the same size as a power amplifier.

This layout obtained an output of 12 watts with good signal intensities and two-way communication on 54 meters up to a distance of 1000 miles. To add a radio-circuity safety factor the dual droops tube use 21-watt oscillator tube and two tubes of the same size in parallel as power amplifiers. The power output of this combination is normally 25 watts, which, it is believed, will be sufficient for any requirements.

DURING Colonel Lindbergh's recent continental flight on the company's new box to Pernambuco, Dutch Guiana he communicated direct from his plane to Miami at distances often exceeding 1500 miles.

The recent Lindbergh flight served as a public demonstration of the efficiency of the Pan-American communication system. Bulletins were sent out at short intervals, not only messages giving the position of the plane, but items for the newspapers. The Miami operator received an average of 3,000 words a day from Lindbergh's plane and most of it appeared in print a few hours later in newspapers all over the United States.

Two weeks later when Colonel Lindbergh was plotting an exploring phase over the last Mayan coast of Guatemala and Yucatan his discontinue was reported in the same manner. All this communication was maintained with one other plane in the air and in touch with their base at the same time.

Mr. Lesterly had cause to feel proud of the system he had built.

PREVENTING AND EXTINGUISHING

Aircraft Fires

By LIEUT. COMDR. C. G. MCCORD, U. S. N.

ANY DISCUSSION of aircraft fire involves itself as two considerations: prevention of fire, and fire extinguishing. They are closely related and should be considered together. In fact they are inseparable, because to successfully extinguish a fire it is most often necessary to restrain the flame.

To cause a fire there must be a source of ignition such as open flame, hot surface or electrical discharge, and a combustible mixture of vapor or gas and air must be brought in contact with it.

In aircraft the danger lies in spread of the fire or in damage to adjoining parts rather than in the first flame, which in nearly every case, starts in the engine compartment.

Exhaust flames are shielded in nitrogen and carbon dioxide and do not readily ignite surrounding vapors. Carbonator blow back is a different matter as the flames are not so shielded and a broken fuel line might cause a great loss of vapor causing the carbonator to blow back, together with released gasoline, is a case of extreme fire hazard, unless cared by the simple expedient of leaving a well drained and smooth air intake well outside the engine compartment, carrying the flame free of danger. One fire or several was caused by striking of an engine part against a steel rail, causing a spark showing how dangerous the cause may be. While no amount of care can eliminate all risk, every effort should be made to do so.

Exposed surfaces on water-cooled engines except exhaust stacks are normally below 212 deg. F. Cylinder barrels of air-cooled engines may run from 300 deg. to 500 deg. F. but these are exposed surfaces, and unlikely to be a source of danger as installed.

Two data are available on fires occurring with air-cooled engine installations, but the open existence of this type is an element of safety.

Prevention of aircraft fires leads back to design and construction—tightness of the fuel system by exhaustive vibration and pressure tests of tanks, pipes and fittings and the relative location of these parts in the plane as well as compartment and air horn drainage. Broken fuel lines usually enter into every fire report in some way.

Gasoline fuels in lighter-than-air craft seem to be dangerous in proportion to their density, as a fire risk. Those heavier than air tend to drop to the lower part of the ship from a leak, whereas those lighter than air rise to parts where the danger is nil. Most conceivable causes of fire in droppable are at a low location.

While it is admitted that neither the means for making planes fireproof, nor apparatus for extinguishing fires in aircraft, have progressed beyond the experimental stage, several important conclusions on the subject have been established by tests at the Naval Aircraft Factory, under the supervision of the author of this article. These conclusions are given, together with a discussion of present lines of development and suggested improvements in current practice. Satisfactory elimination of fire hazard in flying is indicated as a not too remote possibility.

As between liquid and gaseous fuels, purely from the fire hazard standpoint, the chance of quickly releasing the storage tanks from the ship in emergency would recommend the former.

Lubricating or waste oils are probably more dangerous in contact with a hot surface than gasoline, which evaporates and passes off before combustion occurs when in contact with hot surfaces. Latent heat of vaporization also enters into this. 730 deg. F. for heated surfaces (the ignition temperature of kerosene oil and doped fabric being around 750 deg. F.), seems a safe temperature. Although with many liquid fuels a combustible gas is given off when there is contact with a hot surface even lower temperatures, this may dissipate too rapidly to ignite.

Short stacks on the exhaust of an engine, especially if found for best disposition, are better, from the fire hazard standpoint, than collector rings or long exhaust stacks of the standard type. A disintegration study of a Liberty engine showing that while the standard type of stack may run as high as 1,280 deg. F. at its end (full



The working station at the Miami terminal

operation including the vacuum tube, was mounted in a 31-in. laboratory table. This table plugged into a mounting on top of the dynamometer unit.

The dynamometer operated from a standard 12-volt aircraft storage battery, which permitted operation all day without recharging.

The players' units were of two types, one mounted and adjusted to work on a wave length of 54 meters and the other to work on 80 meters for direction finding work.

Each plane carries one of each type of set. The long wave coil system uses the trailing wire antenna as part of the tank circuit and the wave length of emitted signal depends on the length of antenna wire used.

Ground stations were constructed in the Miami shops of the Pan-American, by special permission of the Radio Corporation. Systems were in operation on Oct. 1, Miami Key, West Havana, Cienfuegos, Santiago, Port au Prince, Santo Domingo, San Jose, Port of Spain, Managua, Belice, Comstock, Vera Cruz, Mexico City, Tampico and Brownsville. In a few weeks other stations will be completed at San Juan, Merida, Toluca, Chihuahua, Rosend and Villa Hermosa.

The total cost of these stations is estimated at \$1,380,000.

Each ground station transmitter has a power output of 200 watts and is designed for maximum simplicity, ruggedness and efficiency. One power vacuum tube

December 31, 1959

throttle, lean mixture, retarded spark), the short, fixed struts on the same engine ran below 435 deg. F. The comfort of personnel in the water of exhaust gases and noise, however, is a factor in the design and in most modern types of planes the exhaust is collected and led away from the engine—an advantage for night flying and an aid to comfort although to some extent a menace in a crash. Explosive in the air stream coats the exhaust piping if properly designed.

So far in water-cooled engines are concerned, there appear to be two schools of thought: the idea of having a tight compartment surrounding the engine when shutters are closed and smothering the fire, as opposed to an open and well ventilated engine space in which the fumes and inflammable vapors are readily carried off and the mixture not allowed to reach an explosive air-fuel ratio. Well designed tanks are desired as are the carburetor air horns to see no accumulation of gasoline may be expected in either case.

The accuracy for a light unpowered fireball in a place of conventional type engines is arguable.

Booting of all parts of metal fuselage and engine parts is of importance; the piping systems and electrical conduit or shielding should be included in the booting as all these parts should be at ground potential and high tension have conductors should be carefully separated from grounded parts, 4-in. spacing being recommended. Metal identification tags on ignition cables should be observed. Electrostatic sparks caused by flow of gasoline particularly when venting through charcoal cloth have commonly caused fires and the prevention measure is grounding of both the metal outlet nozzle and the receiving container.

Plastic fuel pipes in plastic containers fire extinguisher that and the introduction of carbon tetrachloride into the gasoline are suggested safety precautions. The former method is open to criticism on account of the danger of the engine pucker being quite as liable to failure as the fuel lines and probably being damaged before the fire is seen. Also such a system would be heavy. The latter method is of little practical value except in local spots, as it was determined by test in an open container that dilution amounting to 71.5 per cent of CCl₄ in gasoline was required to make a non-inflammable mixture.

It has been demonstrated that a pressure or gravity fuel feed is not necessarily a serious hazard provided the tank can be readily shut off. The danger of drenching the plane from a ruptured tank, however, is still there, and an engine operated pump system has the advantage

of the halted fuel flow when the engine stops. There must be a compromise as in most engineering problems—the question of pump failure must be balanced against probable danger in case of fire.

In pressure type gasoline systems it has been suggested that CO₂ pressure be used instead of air pressure. This would add in item of weight and seems hardly worth the cost as the protection afforded is slight. Whether forcing the gas into the gasoline under pressure as in charging sparkling beverages would have an effect on the deteriorating characteristics of the fuel is another matter and aside from the discussion.

BETTERMENT IN probably more hazardous than magnesium engines, as the magnesium stops when the engine dies. The tests are shorter and less liable to breakdown, and the magnesium itself is easily disintegrated.

Fireproofing of fabric by dipping with ammonium phosphate or boron salt is no longer in general use although it was a requirement several years ago. Ventilation of the interior of wing panels where explosive gases may be formed during wing dapping is, however, common practice.

With modern equipment, hangar fires and field equipment fires are not a serious danger to airplanes, and reasonable care and training of field personnel reduces this source of fire to a minimum, although an ignited jet of deep under a wing recently caused a destructive fire in a large new plane in the builder's hangar.

Deeply rooted in the minds of students of the hazardous trades from the time of the first practical aviation is the question "What will I do in case of emergency?" The aviation student has drilled into him the means for combating fires in the tank, collision damage and material failures. The aviation student always had before him the possibility of power plant or structural failure but in both cases a man's consideration is first towards. Commonly or unconsciously the thought of this danger is stored in the back of the mind of the responsible pilot, manager or commanding officer whenever operations are in progress. Much time and thought have been expended on determining causes of fires and the means to apply.

A general rule in the air is to cut off the fuel supply first, close the shutters, extinguish the plane to keep the flames away from wings and cockpit and if possible to blow out the fire, meanwhile operating the extinguisher and then, before landing or cooling, cut the ignition.

This gross reasonable assurance that the fire and the bomber level will be extinguished or at least smothered.

The maining agents may serve to blow the fire out or to impact the fire extinguishing medium against the fire, which causes the effect. The suggestion that it is the fire flames would or some similar substance which burns without definitely volatilizing in pressure, the strong draft is a cure for, rather than an aid in, combustion.

The gases that have been adopted in the past for the extinguishing of fires in aircraft are many and varied. Water is too heavy to be carried into the air for ex-

December 31, 1959

tinguishing fires and is practically useless where gasoline and oil are involved, as it serves to spread, rather than to extinguish a fire of that nature.

Lancet air chemical tanks such as that forced by aluminum sulphate and sodium bicarbonate vapors must be handled with extreme care in case of electric engine, and may be blown away by the air stream, thus losing effectiveness.

Danger of smothering personnel in gas is present when carbon dioxide is used as an extinguishing medium, although this gas is probably the quickest means known of smothering a blaze. The fact that smothering wood or fabric may continue to hold momentary sparks, not being wet, may cause recurrence of the fire after the CO₂ has been expended.

Tetrachloroethane and liquid sulphur dioxide are too toxic in their properties for use in high concentrations; methyl bromide is an asphyxiant, and a number of other materials whose smothering efforts would be useful have been laid in their way for the same reason—while fire being alive extinguished by the same means.

Carbon tetrachloride liberates a smothering gas and cools surfaces on which it is exposed by latent heat of vaporization. The gas formed by applying it on a fire is somewhat toxic and in an enclosed space has produced its powerful halogen by its effect on eyes and throat.

As between CO₂ and CCl₄, which seems to be the safest materials so far considered, the following conclusions are based on tests:

CO₂ is superior to CCl₄ for gasoline fires. CCl₄ systems are in general lighter than CO₂ systems. CCl₄ systems are effective in proportion to rate of discharge.

CO₂ smother fires, whereas CCl₄ dikes gasoline. Small amounts of CO₂ will extinguish a blaze whereas relatively large amounts of CCl₄ are required for adequate diking where much gasoline is present.

CO₂ does not wet the material and recurrence is possible where wood, fabric, etc., are present.

Seven-gallon CO₂ containers for water-cooled and 5 lb. for air-cooled engine installations are recommended.

Use of CO₂ and CCl₄ in combination is recommended.

Wide spraying of the extinguishing medium is an essential and in order to insure that the gas or liquid used must be forced under pressure through manifolds or spray pipes to all parts of the plane in which fire may be expected to break out.

Race nozzles and venting snorkels have been tried with a measure of success.

Placing of CCl₄ bottles in easily broken glass containers which, shattering on impact during the engine cut-off, are of unbroken value in preventing crash loss but their fragility makes them hard to handle.

To expel liquids, air pressure or carbon dioxide pressure of about 100 lb. is commonly used. Other means of syphon are pumping the fluid by piston pump or firing a powder charge into the container. One type makes use of a carbon dioxide cartridge with a cutter which releases the pressure into the fluid container.

Another interesting development of foreign origin consists of two pressure systems, being automatic in its action.

The starter system makes use of a heavy-duty container placed in the Yee of an engine which, when heated, expels a contained liquid creating a vapor pressure which operates through a syphon and bell crank



Carbon dioxide now collecting a smother fire in an unpowered engine exposed in a simulator.

to release compressed air or carbon dioxide from a container communicating with a tank holding the extinguishing fluid, forcing it out to the fire through venting nozzles. The same pressure serves also to shut off the fuel supply, close the shutters, ground the magnet and close the throttle. The total dry weight of the system is below 25 lb. Leakage in the pressure system and possibility of premature operation appear to be the drawbacks to this well-thought-out scheme.

Extinguisher tests are conducted on the ground employing an old fuselage on which a dummy engine and the test apparatus may be mounted, in an air stream provided by a power generator on another engine. The gasoline line to the test engine is snared in places and the carburetor made to flood. The engine is drenched with gasoline and ignited and the slip stream produced. The extinguisher is then operated and the comparative data secured, the operation being repeated as often as necessary to obtain the desired results. Usually a type of extinguisher is tested for its efficacy in connection with both air-cooled and water-cooled installations before its merits are graded.

IN A COMPARATIVE TEST of extinguishers to determine their relative merits according to Naval Aircraft Factory practice, the different types are arranged in order under each of the following headings: (a) Ability to extinguish fires. (b) Ease and safety of operation. (c) Compliance with latest specification. (d) Construction and workmanship. (e) Adaptability to aircraft use under which may be listed: Pressure capacity and weight; proper location; non-toxic qualities; noncorrosive qualities of apparatus and liquid; accessibility; non-freezing qualities of fluid; compactness. (f) Cost.

It may be stated that in connection with most aviation material, fire extinguishers are in process of development with perfection not yet in sight, although the need having arisen, there is active work under way to provide aircraft with the needed protection, and the manufacturers and engineers who are bending their efforts in this direction are entitled to the fullest encouragement by those who make flying a business.



Big air venting pipes of the extinguishers. Note the use of cooling water and proper to absolute aluminum condition.

Airship Base Data Released in Report

House Committee to View Sausalito and Kearney Sites

WASHINGTON (AP)—A Naval Air Station Committee of the House of Representatives, headed by the Hon. Fred A. Oxley, will inspect the Naval Coast Guard Auxiliary Base Sites early in 1970, an announcement says. Following their survey, a final decision on the two sites will be considered by the House. Oxley, who represents the San Francisco, Calif., and Camp Kearney, San Diego County, Calif.—will be the first House Committee.

In the reports of the members of the West Coast Naval Auxiliary Base Board to the House committee, Camp Kearney and Sausalito were compared as to physical characteristics, climate and topography, proximity to other naval bases and strategic location, transportation and communication sources of ships, housing and living conditions, sociological conditions and cost.

Also closely and carefully reviewed

A minority report favoring Camp Kearney was prepared by the Hon. John J. McFall, while those who supported the majority report for Sausalito were Rep. Adam W. A. Moffett, Comdr. Richard Feltus, Lt. Col. George G. Kneeland, and Lt. Col. Carl E. L. Marshall. In presenting the report, in March, Secretary of the Naval Air Station Committee, John J. McFall, said that he favored the selection of the Camp Kearney base "because it is probably somewhat better strategically situated and will have a more direct but better connection with the fleet." He said, however, that either of the alternatives would be in his opinion "the satisfactory."

The total area of the Sausalito site is 1,200 acres, of which 1,000 acres would be available for expansion. The total area of the Camp Kearney site is 2,332.75 acres, of which 1,000 acres would be available for expansion.

Business Suitable Areas

At Sausalito, the entire 1,200-acre site would be available for expansion. At Camp Kearney, only approximately 1,000 acres would be available for expansion. The area of the Sausalito site is 1,200 acres, of which 1,000 acres would be available for expansion. The area of the Camp Kearney site is 2,332.75 acres, of which 1,000 acres would be available for expansion.

Nearly one-half of the Camp Kearney base would require clearing of brush, 1,800 acres are mountains, 8,500 ft. to 10,500 ft. while the Sausalito base is the coastline irregularly shaped; the site is of sand and gravel and considered better for expansion than Sausalito. It is high, barren, mesa land with ex-

tensive steep slopes; area of burning brush and dry grass field would be prohibited of a large area and its growth desirable; and the land is natural.

The average elevation at Sausalito is 35 ft. above sea level while at Camp Kearney, the average elevation is 430 ft. Both bases would have steep slopes, though there are some mountains about

Can You Classify

These Seafarers?

PHILADELPHIA (AP)—

It appears there are good reasons to be sure legal difficulties to be met in the placing of seafarers in the Atlantic as landing fields for trans-Atlantic planes.

Edward J. Armstrong, of Cape May, N.J., manager of the seafaring bureau, has been recently declared the seafarers are seafarers, not sailors, as vessels at land, but the owners, as American citizens. The seafarers are seafarers, not sailors, as vessels at land, but the owners, as American citizens. The seafarers are seafarers, not sailors, as vessels at land, but the owners, as American citizens.

It is in the case of Sausalito. A pilot in favor of Sausalito is its location in a bowl of valleys, making it ideal for airship transport, while Camp Kearney is on a hill. Sausalito is 20 mi. from the coast while Camp Kearney is 7 mi. distant. Sausalito is more accessible to expansion. Camp Kearney where no active civil flight is known in event, but the possibility of decreasing security to damage well-constructed buildings at Sausalito, in event.

Future Expansion

Sausalito is 35 ft. above sea level while at Camp Kearney, the average elevation is 430 ft. Both bases would have steep slopes, though there are some mountains about

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while there is no sea or water or drainage system. Camp Kearney, though a large waste could be built, but it is not a waste.

Both bases are steep slopes, though there are some mountains about

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Sikorsky Projects Include Wind Tunnel

BRIDGEPORT (Conn.)—By next March, work is expected to be finished on a wind tunnel for Sikorsky Aircraft Corp. The wind tunnel is to be built in the Sikorsky Aircraft Corp. The wind tunnel is to be built in the Sikorsky Aircraft Corp. The wind tunnel is to be built in the Sikorsky Aircraft Corp.

There is also under construction a 1,500 ft. long runway, built outside the Sikorsky Aircraft Corp. The runway is to be built in the Sikorsky Aircraft Corp. The runway is to be built in the Sikorsky Aircraft Corp.

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Test Plane Heating Firm

ST. LOUIS (Mo.)—To determine the effectiveness of airplane heating plants has been completed in St. Louis by engineers of the Southwest Air Base. The test plane heating firm is to be built in the Southwest Air Base. The test plane heating firm is to be built in the Southwest Air Base.

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Newark or Bridgeport May Get U. S. Navy Units

NEW YORK (AP)—Newark, N. J., or Bridgeport, Conn., is likely to get the U. S. Navy Air Station which is being moved to give up their base at Rockaway, L. I., in New York City. The U. S. Navy Air Station which is being moved to give up their base at Rockaway, L. I., in New York City.

There has been news to Washington a solid report concerning the decision to move the U. S. Navy Air Station which is being moved to give up their base at Rockaway, L. I., in New York City.

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Schedules Changed For T.A.T.-Maddux

LOS ANGELES (Continued)—Starting Dec. 11, T.A.T.-Maddux Air Lines has rearranged these schedules each day: between Los Angeles and San Francisco (Alameda) at 1:30 p.m., 4:30 p.m., and 7:45 p.m., respectively. San Francisco to Los Angeles at 8:45 a.m., 10:15 a.m., and 4:45 p.m., arriving at the Grand Central Air Terminal, Long Beach, at 12:10 p.m., 3:45 p.m., and 7:30 p.m., respectively.

Each of the three schedules follows a different route, the most northerly schedule northbound being the local place, which follows the San Joaquin valley route and stops at Bakersfield and Fresno while the southern schedule northbound follows the coast route, making one stop at Monterey and will shortly make regular stops at Santa Barbara also. The middle schedule northbound from Los Angeles follows the coast route, stopping at Monterey, Santa Barbara, and San Francisco, making a new airport at that point, while the second southern schedule from San Francisco follows the coast route, making the Bakersfield and Fresno stops. The afternoon schedule both ways is a less frequent service, flying weekly between the two terminals.

Maddux Air Lines has been operating daily flights for several months between Los Angeles and San Francisco, a distance of approximately 100 mi. and prior to opening the Los Angeles-San Francisco route via Maddux. The Los Angeles-Fresno-Bakersfield-Monterey-San Francisco route will be beneficial to operators as a part of the T.A.T.-Maddux chain of airports.

Traffic Control Group Seeks Aid

WASHINGTON (Continued)—The Air Traffic Control Committee, recently organized, is developing a uniform system of handling air traffic around airports, is requesting airport officials throughout the country to cooperate with it by supplying information and suggestions about present and proposed control methods. The program of this committee will not be formulated until a representative sample of suggestions has been received. Communications should be addressed to the Transportation Committee of Congress, 405 E.H. Building, 17th and High Streets, N. W., this city.

Plan Tampa Construction

TAMPA, Fla.—The Aviation Committee of the Chamber of Commerce has outlined the following programs for its new \$750,000 airport project. City officials, including Mayor, will be required to use property, up to and including Jan. 16, complete plan and construction for the airport will be commenced and will be for Feb. 30, actual construction will start March 1.

Night Traffic Control Planned

LOS ANGELES (Continued)—Colored light signals are to be installed soon at the local terminal field of Western Air Ports to handle night traffic in the dark. The signal lights will be mounted on a large overhead framework on a 10 ft pole with two rows of reflectors facing clockwise up and down, and with each row of reflectors equipped with both red and green lights so that when the green lights glow upward the red lights are glowing their reverse downward. A pilot appearing to land will be given the green light as a signal that the field is clear while the red lights will at the same time be visible to pilots on the ground as a warning that a plane is in the air preparing to land. During the night the green lights will show for the ground pilot while the red light will be projected upward as a warning to any pilot in the vicinity.

St. Louis Air Program Outlined

ST. LOUIS (Continued)—The Air Board of the St. Louis Chamber of Commerce has outlined a comprehensive program for 1933 designed to improve St. Louis' position as an aviation center. One of the chief aims is the program called a "triple airport" in which an airport recommended by the Civil Aeronautics Commission. While it would in no way impair the purposes of Lambert-St. Louis Field, it is felt to be a necessary additional development to provide air facilities close to the business district.

Miami Proposes Municipal Hangar for Blimps



Committee Reports On Airways Budget

WASHINGTON (Continued)—President Hoover has approved an appropriation of \$1,400,000 for investigation of atmospheric phenomena by the Weather Bureau, a service of great value to aviation, has been cut to \$1,350,000, in the report submitted to the House by the Appropriations Committee. The general appropriation, however, is an increase of \$220,000 over the appropriation for 1932.

The following increases were allowed: \$98,125 for providing services on air surveys and additional work at night on existing surveys; \$204,600 for examining and installing a reporting system to the San Francisco-San Diego-Chico-Brownsville and air hourly system on the Boston-Bakersfield route; \$25,800 for expenditures of service over the southern sections of the United States extending from Kansas City Port Worth, and San Diego, westward to Los Angeles; \$20,750 for arranging a limited service in Hawaii; and \$14,625 for operation of a meteorological station at Belling Field and control operations at Washington, D.C. The only decrease is for the purchase of a committee on air of \$30,000 for telegraph charges incident to the proposed addition of one word indicating ending and reliability conditions in the recently issued reports and by their fourth of the regular Weather Bureau stations.

Airport Lighting Shown on Miniature Field



TO SHOW THE SCHEME of aviation lighting, they have built a miniature airport which is a feature of the aviation lighting exhibit found in the permanent Worldwingsharing Lighting Institute at the Grand Central Palace, New York City. The explanation of the aviation lighting exhibit is being made by visitors to the institute.

More Lines Announce Lower Passenger Rates

NEW YORK (Continued)—Announcements of more rate reductions in addition to those recently reported in Airways have been received here this week. Rates on all Southwest Air Fast Lines, have been reduced to 50% of regular rates for a 60-day period beginning Jan. 3. At the end of that time, according to a statement by President H. H. Haddock, it is probable that the rate will be made permanent, or that the lines will be discontinued. Transportation to and from airports, and carrying of 25 lb. of baggage is included in the charges.

Transcontinental Air Transport-Mail has also offered special reduction in connection with the purchase of baggage mail, approximately the general rate decrease recently announced. Bookings for 10,000 lb. will be sold at a 50 per cent discount; 20,000 lb. bookings at a 25 per cent discount, and 30,000 lb. bookings at 50 per cent. Necessary arrangements are being made under the direction of Joseph W. Brennan, chief traffic manager.

Mexican Aviation Company is offering holiday rates of one and one-half fares for a round trip from Brownsville to Tampico and Mexico City. The rates are in effect from Dec. 15 to Jan. 3. Reduced rates for hotel officials, travel agents and state officials in California, Nevada, Utah, Wyoming, Colorado, Arizona, New Mexico, Texas, Oklahoma, Kansas and Missouri are also announced by Western Air Express. The

note will be the railroad charge for the same route plus Pullman fare. Meals will be served without charge. Coast Air Transport, operating the air ferry between Seattle and Bremerton, has made a reduction in fare from \$2.00 to \$1.00. Approximately 30,000 passengers have been carried on this service during the past six months.

Asiatic Southern Post Plans

WASHINGTON (Continued)—Marshall C. Huggins and W. J. MacKenzie, Airport authorities of the American Branch, will begin extensive trip through the South this week in January to assist organizations in the selection of airport sites. One official will cover Missouri, Arkansas, Louisiana, Oklahoma, Texas, Mississippi and Arizona, and the other will cover Florida, Georgia, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee and Kentucky. The southern states during this tour, for which no charge is made, should commence with the Associated Airline Branch.

Open Charleston, S. C., Airport

CHARLOTTE (Continued)—Dedication of Charleston Airport opens to public an approved rail field about 1,000 to 1,300 ft. Nearly 1,000 acres are available for use eventually, though the first 100 ft. will be paved road from the city, and is visible a mile of a station on the Southern Railroad. No buildings have been constructed as yet except South for fuel and refreshments.

Government Reports On Airway Facilities

WASHINGTON (Continued)—A complete report of Post Office Air Mail, Contract Air Mail and other airway facilities throughout the year, 1932 was released at the annual report of Mr. Charles M. Young, assistant secretary of commerce for aeronautics. The tables are given below.

Post Office Air Mail	Mail	Flare	Other
1932	10,000,000	10,000,000	10,000,000
1931	10,000,000	10,000,000	10,000,000
1930	10,000,000	10,000,000	10,000,000
1929	10,000,000	10,000,000	10,000,000
1928	10,000,000	10,000,000	10,000,000
1927	10,000,000	10,000,000	10,000,000
1926	10,000,000	10,000,000	10,000,000
1925	10,000,000	10,000,000	10,000,000
1924	10,000,000	10,000,000	10,000,000
1923	10,000,000	10,000,000	10,000,000
1922	10,000,000	10,000,000	10,000,000
1921	10,000,000	10,000,000	10,000,000
1920	10,000,000	10,000,000	10,000,000
1919	10,000,000	10,000,000	10,000,000
1918	10,000,000	10,000,000	10,000,000
1917	10,000,000	10,000,000	10,000,000
1916	10,000,000	10,000,000	10,000,000
1915	10,000,000	10,000,000	10,000,000
1914	10,000,000	10,000,000	10,000,000
1913	10,000,000	10,000,000	10,000,000
1912	10,000,000	10,000,000	10,000,000
1911	10,000,000	10,000,000	10,000,000
1910	10,000,000	10,000,000	10,000,000
1909	10,000,000	10,000,000	10,000,000
1908	10,000,000	10,000,000	10,000,000
1907	10,000,000	10,000,000	10,000,000
1906	10,000,000	10,000,000	10,000,000
1905	10,000,000	10,000,000	10,000,000
1904	10,000,000	10,000,000	10,000,000
1903	10,000,000	10,000,000	10,000,000
1902	10,000,000	10,000,000	10,000,000
1901	10,000,000	10,000,000	10,000,000
1900	10,000,000	10,000,000	10,000,000

Other Airway Operations	Mail	Flare	Other
1932	10,000,000	10,000,000	10,000,000
1931	10,000,000	10,000,000	10,000,000
1930	10,000,000	10,000,000	10,000,000
1929	10,000,000	10,000,000	10,000,000
1928	10,000,000	10,000,000	10,000,000
1927	10,000,000	10,000,000	10,000,000
1926	10,000,000	10,000,000	10,000,000
1925	10,000,000	10,000,000	10,000,000
1924	10,000,000	10,000,000	10,000,000
1923	10,000,000	10,000,000	10,000,000
1922	10,000,000	10,000,000	10,000,000
1921	10,000,000	10,000,000	10,000,000
1920	10,000,000	10,000,000	10,000,000
1919	10,000,000	10,000,000	10,000,000
1918	10,000,000	10,000,000	10,000,000
1917	10,000,000	10,000,000	10,000,000
1916	10,000,000	10,000,000	10,000,000
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1913	10,000,000	10,000,000	10,000,000
1912	10,000,000	10,000,000	10,000,000
1911	10,000,000	10,000,000	10,000,000
1910	10,000,000	10,000,000	10,000,000
1909	10,000,000	10,000,000	10,000,000
1908	10,000,000	10,000,000	10,000,000
1907	10,000,000	10,000,000	10,000,000
1906	10,000,000	10,000,000	10,000,000
1905	10,000,000	10,000,000	10,000,000
1904	10,000,000	10,000,000	10,000,000
1903	10,000,000	10,000,000	10,000,000
1902	10,000,000	10,000,000	10,000,000
1901	10,000,000	10,000,000	10,000,000
1900	10,000,000	10,000,000	10,000,000

Notes from both the established operations and the new ones are included, and including the total number of flights, and the total number of passengers, and the total number of cargo, and the total number of mail, and the total number of other airway operations.

Open Buffalo Weather Bureau
HUFFALO (Continued)—Regular night and day operation at the weather bureau station of the Buffalo Airport was begun Dec. 16, with James H. Bennett, meteorologist in charge. The new bureau is modern in every detail.



SIDE SLIPS

By
Robert R. Osborn

THE INSTANT AVIATOR, and his peripatetic career, The Sterling Mechanic, came into the office to see me today. They said that in the past all tests and research which were made by my organization seemed to be only for improving military airplanes, and they thought it was about time that some one paid more attention to the commercial airplane from a research point of view. With this in mind, they thought it would be a good idea to start the ball rolling on vibration, with some sort of contribution to engineering knowledge. Having read a report of a vibration test on a fuselage, which had been run by some government experts, they decided it would be a good idea to run a similar test on a commercial airplane fuselage. Their report on their efforts follows:

Vibration Test of a Fuselage

Object

To determine effects of vibration on modern commercial fuselages

Procedure

JN4-D fuselage with GX-3 engine was mounted by wing lugs in a jig. Weights were added to make the balance come out right, which caused the jig to break. Understood that all jigs in the airplane business always break, so not worried. Rebuilt jig. Motor was started and caused to continue running. Effects on fuselage were as follows:

1st hour: Magnets flew off motor again. Replaced magnets.

4th hour: Gas took on dry casting noise to stop. However, motor kept running for five minutes because of poor compression. Refilled gas tank.

7th hour: Magnets flew off motor again. Replaced magnets and fastened with baking wire as bolts are not strong enough.

7th hour: Magnets flew off engine again. Replaced and secured with baking wire and put on screw to hold it down.

8th hour: Motor flew off the engine. Replaced motor on magnets.

9th hour: R. H. Deane Jr. dropped

in to see test. Claimed it wasn't a loose bearing. Said it was a Standard and fuselage. Decided to continue and anyway. To illustrate point in his argument, Mr. Deane provided for on jig. Jig rebuilt.

10th hour: Magnets flew off engine. Tapered Aviator made a clean catch of magnets off right side lower. drove to Sterling Mechanic who replaced on motor before it slipped, causing scoring pins, and on match.

11th hour: G-5 Inland came in to see test. Claimed it wasn't an GX-3 motor. Said it was a Selmon water-cooled radial. Decided to continue test anyway. Mr. Inland brought about out of pipe on jig. Jig rebuilt.

12th hour: Nothing happened. Complete investigation failed to reveal cause.

13th hour: Magnets discovered to be missing. Suspected Mr. Inland. Motor now running on hot carbon deposits. Runs about 200 better.

15th hour: Sent Gas Day out for four hours sandwiches and coffee.

20th hour: Gas Day returned with apple pie and Coca-Cola.

20th hour: Piston oscillation developed in motor mount. Positioned cocktail shaker to motor mount.

21st hour: Contents of cocktail shaker found to be mostly food oil so poured it out. Gas. Motor about 200 revs better.

22nd hour: Greaseball exploded. Jig rebuilt.

24th hour: Candy Jones dropped in to see test. Said it wasn't a Standard and fuselage with a Selmon motor. Said it was his Raring Oxide fuselage with C-4 engine. Engine removed, motor's valve and picked up 426 more revs.

25th hour: Deak Lyons of the New York Times came in to offer large sum for exclusive story of this test. Loyalty to AVIATION held us against all temptation. However told him the filing picture might for two days.

25th hour: Motor discovered to be running backward. Decided test was just as good that way as ship wasn't

getting anywhere no matter which way engine turned.

26th hour: Mr. Inland came back with the magnets. Said he found it and found it wasn't worth stealing.

26th hour: Rear half of the fuselage fell off the frame half. At first the vibrations referred to this point. The Sterling Mechanic claiming that the front half fell off the rear half. However, the Imperial Aviator cracked the 36th hour with first and proved his contention. Scoring, scratches laid out in answer to rest, with magnets on his chest.

26th hour: Magnets fell off the Sterling Mechanic.

26th hour: Sterling Mechanic regained consciousness. Rear half of fuselage not replaced in jig as it was needed to support some plates to make a card table. Changed title of test to "Vibration Test of Food Half of Fuselage."

26th hour: Motor and fuselage appeared to be flying under low ceiling. Rapidly getting below the ceiling. Just about to look around for a place to go down when it was discovered Sterling Mechanic was smoking one of Deak Lyons's cigars. Cigar placed in smoke, snatched and he charged up but got started smoking on stairs and wires.

26th hour: Decided to determine test as broken but called up for more magnets. Unable to stop engine so decided to make fifty hour test on it. A Gas Department of Commerce inspector to look it over and smoked out when he had not tested.

Conclusions

1. Fuselages appear to be stronger in high resistance, low resistance, three point loading, level loading, inverted flight diving and roll. Other conditions remain as at present.

2. It is extremely unlikely that Dr. Cook reached the North Pole.

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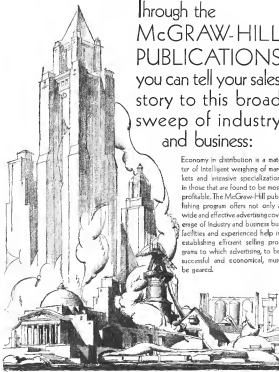
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